

## Gate resistor installed Dual N-channel MOS FET

For lithium-ion secondary battery protection circuits

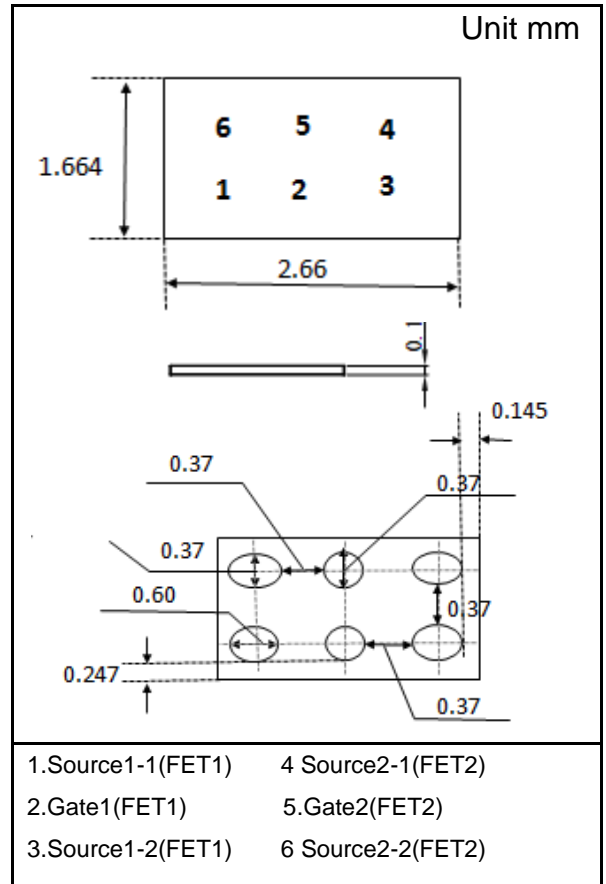
### General Features

- Low source-source ON resistance:  $R_{ss(on)}$  typ. = 5.6 m $\Omega$ , (VGS = 4.5 V)
- CSP(Chip Size Package)
- RoHS compliant (EU RoHS / MSL:Level 1 compliant)

### Marking Symbol:16

### Packaging

- Embossed type (Thermo-compression sealing) : 10000pcs / reel (standard)

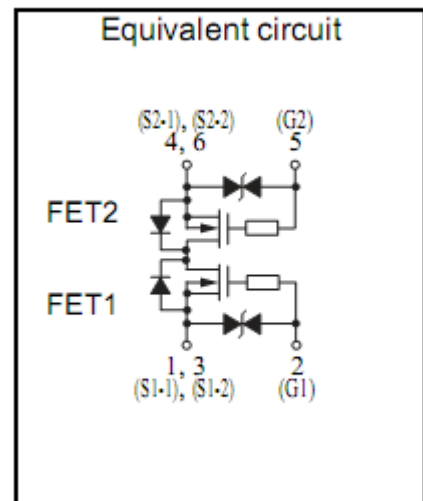


### Absolute Maximum Ratings Ta = 25°C

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	VDS	12	V
Gate-source Voltage *3	VGS	+/-12	V
Source Current	DC *1	IS1	15 A
	Pulse*2	ISp	80 A
Total Power Dissipation	DC *1	PD1	0.45 W
Channel Temperature	Tch	150	°C
Storage Temperature Range	Tstg	-55 to +150	°C
Thermal resistance(ch-a)	DC *1	Rth1	278 °C/W

Note \*1 Mounted on FR4 board (25.4mm X25.4mmX t1.0mm, 36um Copper)

\*2 t = 10us, Duty Cycle ≤1 %



## Electrical Characteristics Ta = 25 °C ±3 °C

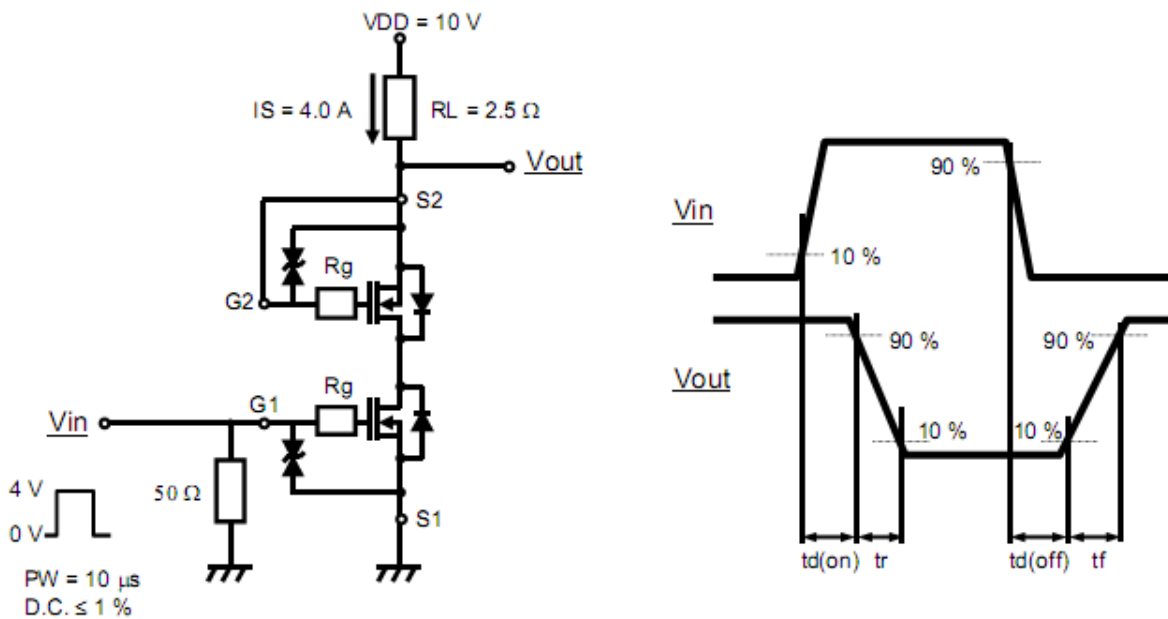
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-source Breakdown Voltage	VDSS	IS = 1 mA, VGS = 0 V	12			V
Zero Gate Voltage Source Current	ISSS	VSS = 12 V, VGS = 0 V			1.0	uA
Gate-source Leakage Current	IGSS	VGS = ±10 V, VSS = 0 V			±100	nA
Gate-source Threshold Voltage	Vth	IS = 0.5 mA, VSS = 10 V	0.4	0.7	10	V
Source-source On-state Resistance	RSS(on)1	IS = 4.0 A, VGS = 4.5 V		5.6	7.8	mΩ
	RSS(on)2	IS = 4.0 A, VGS = 2.5 V		8.4	11.8	
Body Diode Forward Voltage	VF(s-s)	IF = 4.0 A, VGS = 0 V		0.8	1.2	V
Input Capacitance	Ciss	VSS = 10 V, VGS = 0 V, f = 1 MHz		2760		pF
Output Capacitance	Coss			450		
Reverse Transfer Capacitance	Crss			390		
Turn-on delay Time	td(on)	VDD = 10 V, VGS = 0 to 4.0 V		4.1		μs
Rise Time	tr	IS = 4.0 A		5.2		
Turn-off delay Time	td(off)	VDD = 10 V, VGS = 4.0 to 0 V		12.9		μs
Fall Time	tf	IS = 4.0 A		8.3		
Total Gate Charge	Qg	VDD = 10 V		26		nC
Gate-source Charge	Qgs	VGS = 0 to 4.0 V,		9		
Gate-drain Charge	Qgd	IS = 4.0 A		8		

Note Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 Measuring methods for transistors.

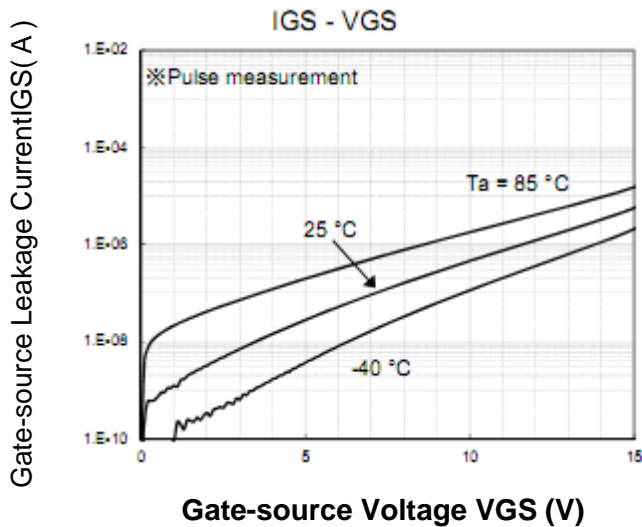
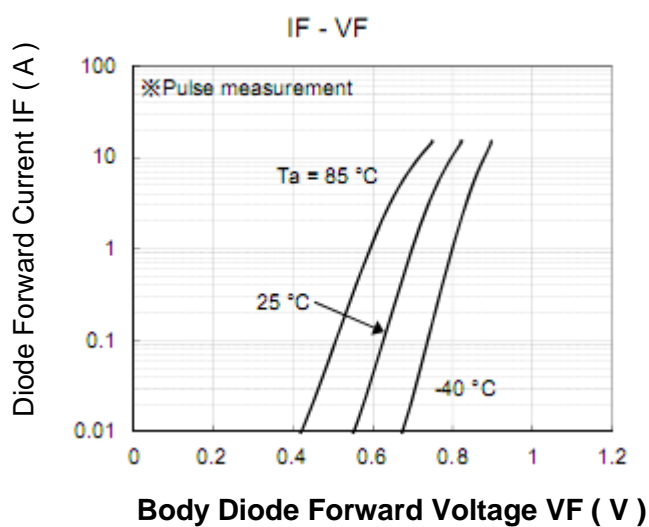
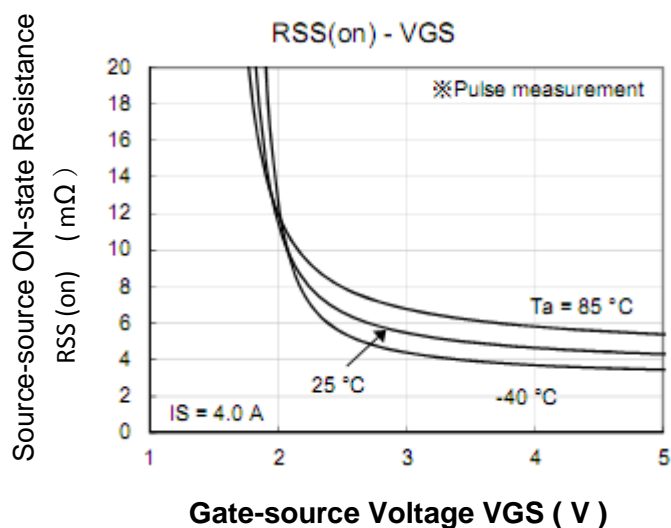
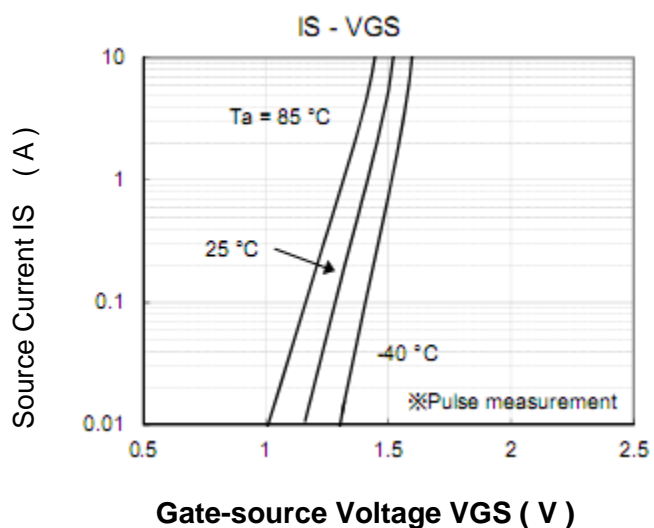
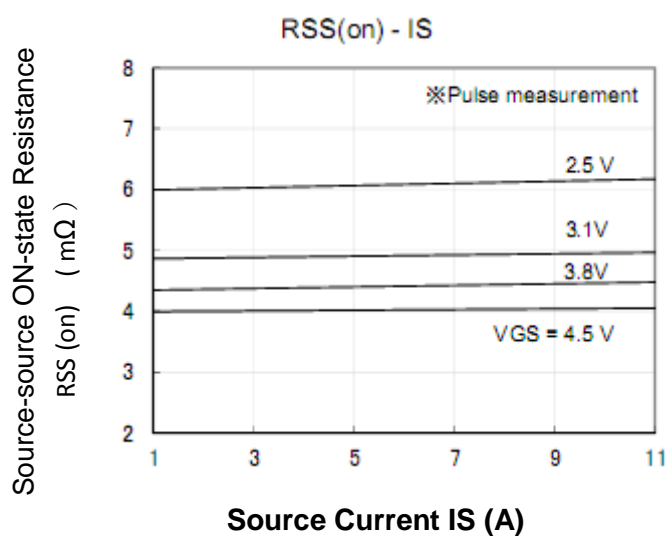
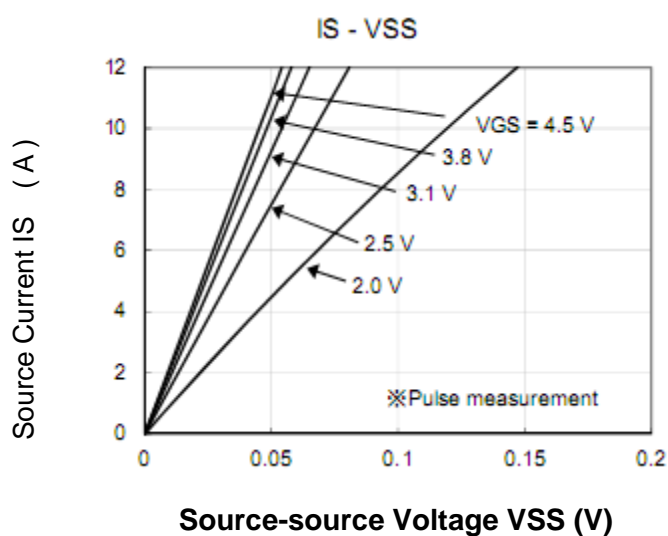
\*1 Guaranteed by design, not subject to production testing

\*2 Measurement circuit for Turn-on Delay Time / Rise Time / Turn-off Delay Time / Fall Time

Note2: Measurement circuit

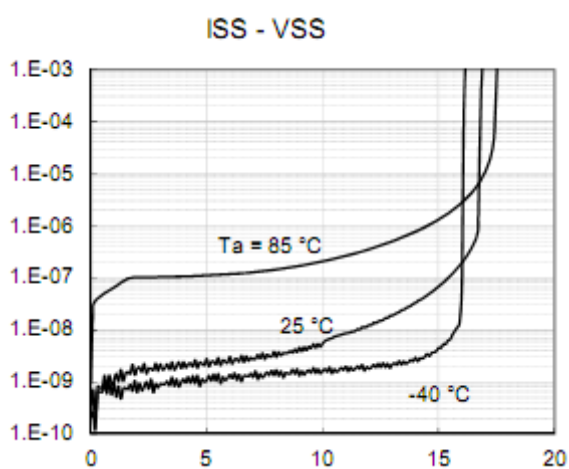


## Technical Data ( reference )



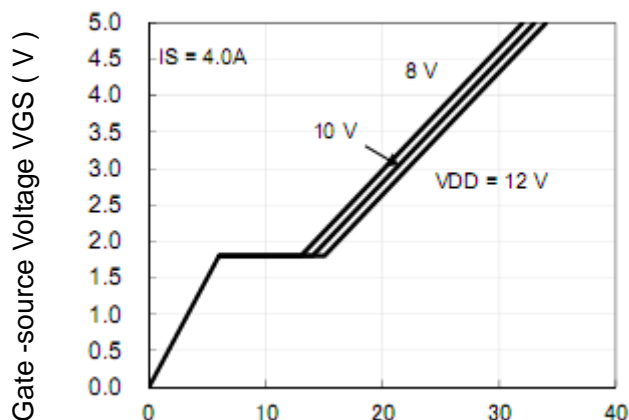
## Technical Data ( reference )

Zero Gate Voltage Source Current ISS ( A )



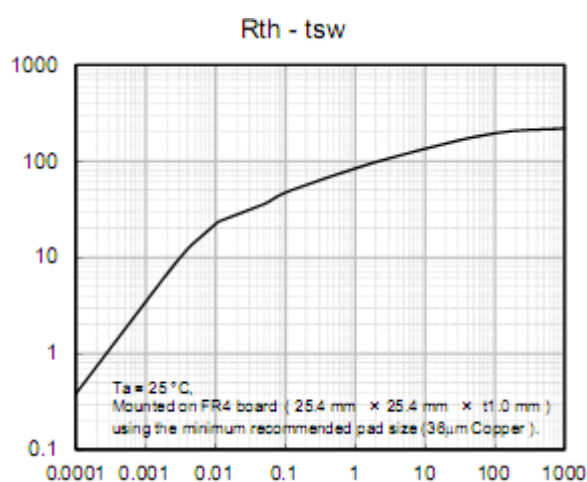
Source-source Voltage VSS ( V )

Dynamic Input/Output Characteristics



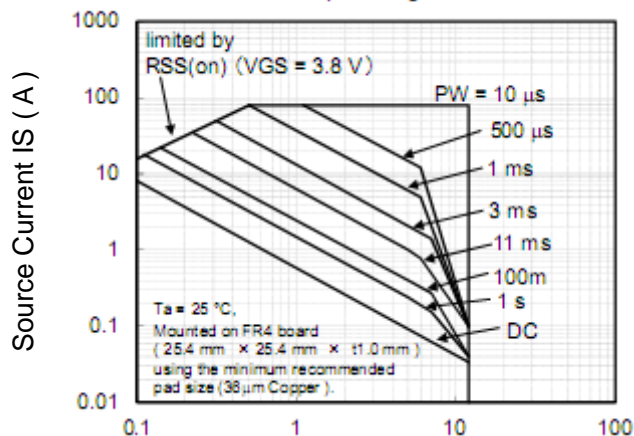
Gate Charge ( nC )

Thermal Resistance Rth ( °CW )



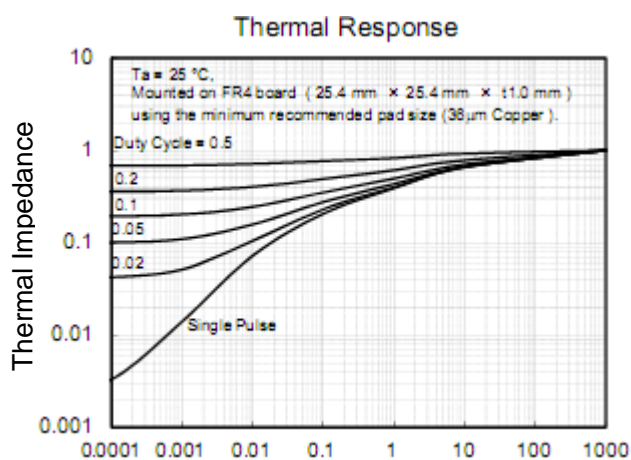
Pulse Width tsw ( s )

Safe Operating Area



Source-source Voltage VSS ( V )

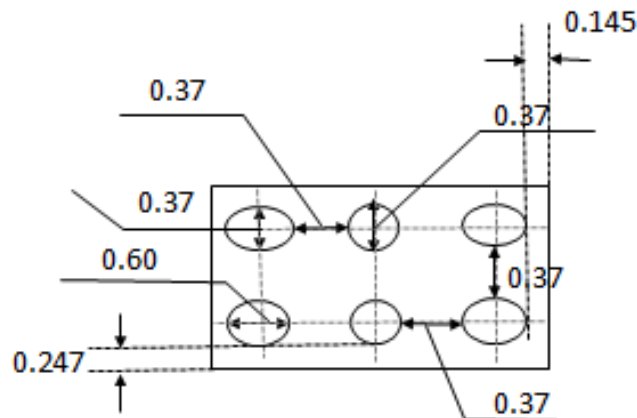
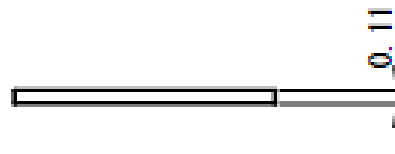
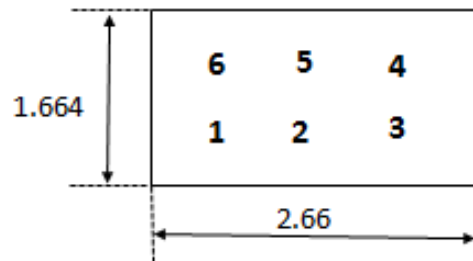
Normalized Effective Transient Thermal Impedance



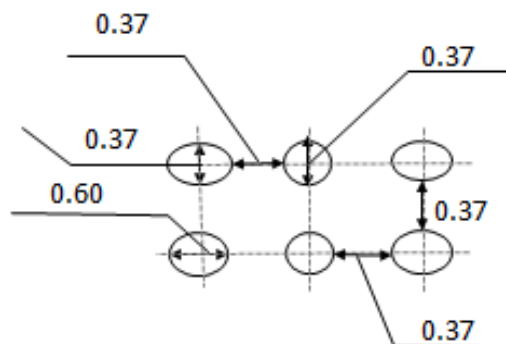
Square Wave Pulse Duration ( s )

Chip Size Package

Unit: mm



Land Pattern (Reference) (Unit: mm)



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